

What is claimed is:

1. A system for measuring a parameter in a subsea well, comprising:
  - a riser extending from a platform adjacent the ocean surface towards the ocean bottom;
  - a landing string extending within the riser from the platform towards the ocean bottom; and
  - a line extending along at least part of a length of the landing string and including a distributed sensor system for sensing the parameter at various points along the length of the landing string.
- 10 2. The system of claim 1, wherein:
  - the landing string extends at least partially within a pressure control equipment at the ocean bottom; and
  - the line extends at least partially within the pressure control equipment.
- 15 3. The system of claim 1, wherein the line comprises a fiber optic line.
4. The system of claim 1, wherein the parameter measured is temperature.
5. The system of claim 4, wherein the distributed sensor system comprises a plurality of sensors distributed along the length of the line.
- 20 6. The system of claim 5, wherein the temperature sensors comprise fiber optic temperature sensors.
- 25 7. The system of claim 4, wherein the distributed sensor system comprises a fiber optic line and wherein light is transmitted through the fiber optic line and the returned back-scattered light is measured to provide a complete temperature profile along the length of the fiber optic line.
- 30 8. The system of claim 1, wherein the line is mechanically attached to the landing string.

9. The system of claim 3, further comprising:  
a conduit located proximate the landing string; and  
the fiber optic line located within the conduit.

5

10. The system of claim 9, wherein the conduit is within a control umbilical  
deployed as part of the landing string.

11. The system of claim 10, wherein the conduit is one of either a hydraulic  
10 control conduit or chemical injection line that comprise the control umbilical.

12. The system of claim 9, wherein the conduit is a conduit specifically deployed  
to house the fiber optic line.

15 13. The system of claim 9, wherein the fiber optic line is deployed by pumping the  
fiber optic line through the conduit by way of fluid drag.

14. The system of claim 9, wherein the conduit includes a surface return line.

20 15. The system of claim 1, wherein the line is located interior to the marine riser.

16. The system of claim 1, wherein the line is located exterior to the marine riser.

17. The system of claim 1, wherein:  
25 the landing string is landed on a landing shoulder located on a pressure control  
equipment; and  
the line extends below the landing shoulder.

18. The system of claim 17, wherein:  
30 the landing string includes a passageway having a port above the landing shoulder and  
a port below the landing shoulder, each port providing communication to the exterior of the  
landing string; and

the line is extended below the landing shoulder by passing the line through the passageway and the ports past the landing shoulder.

19. The system of claim 18, wherein:

5 the line is a fiber optic line;

a conduit is located proximate the landing string and is aligned with the passageway port located above the landing shoulder; and

the fiber optic line is located within the conduit and is extended below the landing shoulder by passing the line through the passageway and the ports past the landing shoulder.

10

20. The system of claim 19, wherein the fiber optic line is deployed by pumping the fiber optic line through the conduit and passageway.

21. The system of claim 20, wherein:

15 a second conduit is aligned with the passageway port located below the landing shoulder;

the fiber optic line is located within the conduit, is extended below the landing shoulder by passing the line through the passageway and the ports past the landing shoulder, and extends within the second conduit; and

20 the fiber optic line is deployed by pumping the fiber optic line through the conduit, passageway, and second conduit.

22. The system of claim 1, wherein the line comprises a communications line transmitting information.

25

23. The system of claim 22, wherein the information transmitted is between the platform and a component located below the ocean surface.

24. The system of claim 22, wherein the information transmitted is a command directed at the component.

25. The system of claim 1, further comprising a permanent completion attached below the landing string.

26. The system of claim 25, wherein the line extends along at least part of a length 5 of the permanent completion.

27. The system of claim 26, wherein the line is monitored during deployment of the landing string and the permanent completion to determine whether the functionality of the line is compromised during deployment.

10

28. A method for measuring a parameter in a subsea well, comprising:  
deploying a landing string within a riser, the landing string and riser extending from a platform on the ocean surface towards the ocean bottom;  
deploying a line along at least part of a length of the landing string, the line including 15 a distributed sensor system for sensing the parameter at various points along the length of the landing string ; and  
measuring the parameter at the various measurement points along the length of the landing string.

20

29. The method of claim 28, wherein the line comprises a fiber optic line.

30. The method of claim 28, wherein the measuring step comprises measuring temperature at the various measurement points along the length of the landing string.

25

31. The method of claim 30, wherein the line comprises a fiber optic line and the measuring step comprises transmitting light through the fiber optic line and analyzing the returned back-scattered light to provide a complete temperature profile along the length of the fiber line.

30

32. The method of claim 28, wherein the deploying the line step comprises mechanically attaching the line to the landing string.

33. The method of claim 28, wherein the deploying the line step comprises disposing the line within a conduit located proximate the landing string.

34. The method of claim 33, wherein the disposing step comprises disposing the line within a conduit included in a control umbilical that is part of the landing string.

35. The method of claim 33, wherein the deploying the line step comprises pumping the fiber optic line through the conduit by way of fluid drag.

36. The method of claim 28, wherein:  
the deploying the landing string step comprises landing out the landing string at a landing shoulder located on a pressure control equipment; and  
the deploying the line step comprises extending the line below the landing shoulder.

37. The method of claim 28, wherein the deploying the line step comprises deploying the line at least partially within the pressure control equipment.

38. The method of claim 28, wherein the deploying the line step comprises deploying the line internally to the marine riser.

39. The method of claim 28, wherein the deploying the line step comprises deploying the line externally to the marine riser.

40. The method of claim 22, further comprising attaching a permanent completion below the landing string.

41. The method of claim 40, further comprising deploying the line along at least part of a length of the permanent completion.

42. The method of claim 41, further comprising monitoring the parameters measured by the line during deployment to determine whether the functionality of the line is compromised during deployment.

43. A method for monitoring solids in a tubing, comprising:  
deploying a fiber optic line along at least part of the length of the tubing, the line  
comprising a part of a distributed temperature sensor;

5 measuring the temperature along at least part of the length of the tubing with the  
distributed temperature sensor; and  
determining the presence of solids near the tubing by analyzing the temperature  
measurements.

10 44. The method of claim 43, wherein the measuring the temperature comprises  
measuring the temperature inside the tubing.

45. The method of claim 43, wherein the measuring the temperature comprises:  
measuring the temperature outside of the tubing.

15 46. The method of claim 43, wherein the tubing comprises a marine riser.

47. The method of claim 43, wherein the tubing comprises a landing string.

20 48. The method of claim 43, wherein the tubing comprises a production tubing.

49. The method of claim 43, wherein the tubing comprises a subsea pipeline.

50. The method of claim 43, wherein the tubing comprises an industrial pipeline

25 51. The method of claim 43, further comprising monitoring the removal of solids  
in response to the measuring.

52. The method of claim 43, further comprising identifying a substance near the tubing in response to the determination of the presence of hydrates near the tubing.

53. The method of claim 43, wherein the determining step further comprises  
5 determining the location of the solids by analyzing the temperature measurements.

54. The method of claim 52, wherein the determining step further comprises determining the effect of treatment conducted on the solids by analyzing the temperature measurements.

10

55. The method of claim 43, wherein the deploying a fiber optic line comprises pumping the line through a conduit located proximate the landing string by way of fluid drag.